The Formation of Expectations: Some Evidence from Weekly Money Supply Forecasts

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83-005

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1. Introduction

A model's predictions often depend crucially on the process assumed to capture the formation of expectations. Empirical studies using actual expectations data have investigated the processes by which expectations are formed and the "rationality" of such forecasts. For example, studies have analyzed the Livingston price forecasts [Turnovsky (1970), Pesando (1975), Carlson (1977) and Hafer and Resler (1982)], interest rate forecasts [B. Friedman (1980)] and, more recently, forecasts of weekly money stock changes [Grossman (1981), Roley (1982), Urich and Wachtel (1983) and Hafer (1983)]. Unlike other survey data, however, relatively little has been done to investigate the process by which expectations of weekly money supply changes are formed.[1/] Moreover, the change in the implementation of monetary policy in October 1979 permits an investigation into the impact of a policy regime change on the formation of expectations. The purpose of this paper, therefore, is twofold: First, we examine the structure of expectations about weekly money stock changes. Second, we shall test the hypothesis that the change in the operating procedures of monetary policy altered the expectations formation process.

2. Formation of Expectations

Expectations generally are hypothesized to be formed by an adaptive or extrapolative process. The former hypothesizes that forecasters "adjust" their current forecast to past forecast errors by some fraction. Following Turnovsky (1970), adaptive expectations can be modelled as:

$$(1) \quad {}_{t-1}M_t^E = \alpha_0 + \alpha_1 \, {}_{t-2}M_{t-1}^E + \alpha_2 \, M_{t-1}$$

where ${}_{t-1}M_t^E$ is the expectation formed in period t-1 for the <u>change</u> in money

between period t-1 and t, and M_{t-1} is the actual change in the money stock last period. If $\alpha_0 = 0$ and $\alpha_1 + \alpha_2 = 1$, equation (1) reduces to the more common adaptive model.[2/] If expectations are formed adaptively, empirically it should be the case that $\alpha_1 + \alpha_2 > 0$.

Extrapolative expectations assume that past trends are expected to continue or be reversed (regressive expectations). The extrapolative model is given by the equation:

$$(2) \quad {}_{t-1}M^E_t = \beta_0 + \beta_1 \ M_{t-1} + \beta_2 \ \Delta M_{t-1}$$

where $\Delta M_{t-1} = M_{t-1} - M_{t-2}$. If $\beta_0 = 0$ and $\beta_1 = 1$, equation (2) reduces to a more common but restrictive specification.[3/] More importantly, if $\beta_2 < 0$, expectations are extrapolative. If $\beta_2 > 0$, however, expectations are regressive. Finally, if $\beta_0 = \beta_2 = 0$ and $\beta_1 = 1$, expectations are said to be formed statically. Equation (2) allows us to test these restrictions.

Because weekly data are used, some lagged response of expectations to past changes is allowed. Thus, the less restrictive versions of equations (1) and (2) estimated are:

$$(1') \quad {}_{t-1}M^E_t = \alpha_0 + \alpha_1 \ {}_{t-2}M^E_{t-1} + \sum_{i=1}^{J} \alpha_{i+1} \ M_{t-i} + \epsilon_t$$

and

$$(2') \quad {}_{t-1}M^E_t = \beta_0 + \beta_1 \ M_{t-1} + \sum_{j=0}^{K} \beta_{j+2} \ \Delta M_{t-j-1} + \eta_t.$$

3. Data and Empirical Results

The data used consist of expected and actual weekly money stock changes for the period March 15, 1978 to June 16, 1982. The expected money changes were obtained from Money Market Services, Inc. Since 1977 this firm has polled 50 to 60 government securities dealers on a weekly basis to get their expectations for the change in money (M1). Prior to 1980, the survey was conducted each Tuesday and Thursday. Since that time only the Thursday survey has been conducted consistently. In this study, we use the mean of the Thursday survey responses to measure expected money changes.

Actual money stock changes are taken from the Federal Reserve's H.6 weekly statistical release. Because the sample period incorporates changing money definitions, the following guidelines are used: From March 1978 to January 1980, the money supply is defined in terms of "old" M1. From February 1980 to November 1981, the definition used is M1B not adjusted for NOW account movements. From November 1981 to June 1982, the current M1 definition is used. In all cases, the money stock data used is that available to the forecasters at the time their forecasts were reported.[4/]

The results of estimating equations (1') and (2') with the lag structure that minimized the regression standard error are presented in table 1. The results indicate that the adaptive model does poorly in explaining the expectations of weekly money stock changes. Since $\hat{\Sigma\alpha}_{i+1} = -0.656$ ($t = 6.04$) and $\hat{\alpha}_1 = 0.332$, we can easily reject the hypothesis that $\hat{\alpha}_1 + \hat{\alpha}_2 = 1$ ($t = 8.90$). Moreover, the estimated adjustment term ($\hat{\Sigma a}_{i+1}$) is less than zero, implying a negative rate of adaptation. Thus, the empirical results are clearly inconsistent with the theoretical model.

The results from estimating equation (2') suggest that the extrapolative model explains the expectations formation process better than the adaptive model.[5/] Note that the constant term is significantly different from zero and the hypothesis that $\hat{\beta}_1 = 1$ is easily rejected ($t = 37.6$).[6/] The results suggest that the expectations of weekly money stock changes are formed regressively, since $\Sigma\beta_{j+2} < 0$.[7/] Thus, the results indicate that past increases in the money stock are expected not to continue, but to reverse themselves.[8/]

The hypothesis now tested concerns the stability of the two models across the October 1979 change in operating procedures. Using a Chow test and a break-point of October 10, 1979, each equation was found to be statistically stable. The calculated F-statistics are: adaptive model--$F(10,203) = 1.03$; extrapolative model--$F(6,211) = 1.61$. Each F-statistic is well-below its respective 5 percent critical value. Thus, the hypothesis of stability cannot be rejected, suggesting that the change in operating procedures did not significantly alter the expectations formation process.

4. Conclusion

This paper has presented evidence about the formation of expectations of weekly money supply changes. The empirical results obtained from the sample period March 1978 to June 1982 indicate that the expectations process is modelled best as regressive. This suggests that market participants expect past trends in money to reverse themselves in the future. Moreover, the results are stable across the October 1979 change in operating procedures.

FOOTNOTES

1/ One exception is Urich and Wachtel (1983). Unfortunately, their sample period ends in January 1980 and does not, therefore, permit testing for the effects of the October 1979 change in operating procedures.

2/ i.e., ${}_{t-1}M^{E}_{t} - {}_{t-2}M^{E}_{t-1} = \lambda(M_{t-1} - {}_{t-2}M^{E}_{t-1})$ $0 \leq \lambda \leq 1$.

3/ i.e., ${}_{t-1}M^{E}_{t} - M_{t-1} = \delta \Delta M_{t-1}$.

4/ In forming the actual change in the money stock between period t-1 and t, only the initially announced data for t would be available to the forecaster. The data for t-1 would consist of the one-week revised series. Consequently, the change in actual money from t-1 to t is defined as the initially announced level less the one-week revised figure as reported in the H.6. For lags further back, the one-week revised figures are used. It should be noted that using originally released data did not alter the findings.

5/ Note that a first-order autocorrelation correction procedure was necessary to estimate the extrapolative model.

6/ This finding supports our use of equation (2) instead of the more common version given in fn. 3.

7/ Similar results are reported by Urich and Wachtel (1983).

8/ This result also gets support from Roley's (1982) finding that unanticipated changes in money that lie outside the announced Fed growth ranges have a larger impact on interest rates than other unanticipated money changes.

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Table 1
Estimated Coefficients for Adaptive and Extrapolative Models of Expectations
Sample Period: March 15, 1978 to June 16, 1982

Adaptive Model		Extrapolative Model	
Variables	Estimated Coefficients [a]	Variable	Estimated Coefficients [a]
Constant	0.594 (6.31)	Constant	0.317 (3.42)
$_{t-2}M^{E}_{t-1}$	0.332 (4.48)	M_{t-1}	0.202 (9.51)
M_{t-1}	-0.345 (11.48)	ΔM_{t-1}	-0.159 (7.75)
M_{t-2}	-0.093 (3.26)	ΔM_{t-2}	-0.184 (6.58)
M_{t-3}	-0.097 (3.54)	ΔM_{t-3}	-0.173 (6.36)
M_{t-4}	0.020 (0.70)	ΔM_{t-4}	-0.076 (4.30)
M_{t-5}	-0.010 (0.39)		
M_{t-6}	-0.084 (3.18)		
M_{t-7}	-0.028 (1.05)		
M_{t-8}	-0.019 (0.76)		
$\bar{R}^2$	0.451		0.524
SE	0.880		0.819
DW	2.04		2.10
$\hat{\rho}_1$	---		0.41 (6.65)

[a] Figures in parentheses are absolute values of t-statistics.